NOAA NESDIS
CENTRAL SATELLITE DATA PROCESSING CENTER

Advanced Very High Resolution Radiometer (AVHRR) Level 1b Format Differences

Version 1.1

September 27, 2004

Computer Sciences Corporation
Laurel, Maryland

Table of Contents

1 Purpose

This document lists the modifications made to the current AVHRR (GAC, HPRT, LAC) 1b format, referred to as the "NOAA-KLM 1b format", to create the new 1b format, referred to as the "NOAA-N/Metop 1b format", to be implemented for the launch of NOAA-N. Therefore, it essentially identifies the differences between these two formats. When implemented, the new NOAA-N/Metop 1b format will be applicable to all 1b data sets produced from the NOAA-KLMNN' and Metop satellites. This document also identifies those modifications to the previous release of the NOAA-N/Metop AVHRR 1b format (dated June 13, 2003) that were made as part of the creation of this new 1b format. These modifications are specified in *italic* type.

2 Documentation Updates

- Added indications of fields that are applicable to just NOAA or just Metop.
- Added Metop and NOAA-NN' spacecraft IDs in "Spacecraft Identification Code" field (byte offset 73-74) in header record. Renamed this field from "NOAA Spacecraft Identification Code" since Metop IDs are now included.
- Updated values for "Instrument ID" field in header record (byte offset 75-76) to include the instrument IDs of the NOAA-NN' and Metop-1/-2 satellites.
- Added "FRAC" (value = 13) as a new data type in the "Data Type Code" field in the header record (byte offset 77-78).
- Updated values for "Data Source" field in header record (byte offset 155-156) to include new source of data (e.g., Svalbard).
- The 4-byte data record field "Scan Line Quality Flags" (bytes 29-32) was split into four separate 1-byte fields. Only the way this field has been organized and documented in the format has changed. Its content and the location of each of its individual flags remain unchanged. The four "new" fields are
  - "Scan Line Quality Flags [<Reserved>] (zero fill)" (byte 29),
  - "Scan Line Quality Flags [Time Problem Code]" (byte 30),
  - "Scan Line Quality Flags [Calibration Problem Code]" (byte 31), and
  - "Scan Line Quality Flags [Earth Location Problem Code]" (byte 32).

3 Header Record Modifications

- Added definitions for bits 0 and 1, which were previously undefined (zero fill), of "Earth Location Error Code" (byte offset 151-152). These are defined the same as in "Scan Line Quality Flags [Earth Location Problem Code]" in data record (see below).
- Renamed "Ramp/Auto Calibration Indicators Bit Field" to "Ramp Calibration Indicators Bit Field" (byte offset 187-188). This field is based on the pre-NOAA-K header field of a similar name. The pre-K 1b headers were all the same. Thus this field meant one thing for AVHRR and a different thing for HIRS. The "auto" portion of this field name is applicable to just HIRS, and thus eliminated here in the AVHRR 1b specification..
- *Changed bit 0 of the "Earth Location Bit Field" (byte offset 339-340) from "attitude error correction (0=not corrected; 1=corrected)" to "constant attitude error correction (0=not performed; 1=performed)". Defined bit 2, which was previously undefined, as "dynamic attitude error correction (0=not performed; 1=performed)".*

- Updated the "ANALOG TELEMETRY CONVERSION" section (byte offset 425-952) as follows:
    - Replaced "<Reserved>" fields with a 6th coefficient for each telemetry item.
    - Increased the word size of each field in this section from 2 bytes to 4 bytes to allow for more and better precision.
    - Changed these coefficients' scale factors, which were all 2s, to 6 (coefficient 1), 6 (coef. 2), 7 (coef. 3) , 8 (coef. 4), 9 (coef. 5), and 10 (coef. 6).
- *The following fields, related to Metop maneuvers, were added in the filler area at the end of the header record:*
    - *"Start of Maneuver Year" (byte offset 953-954).*
    - *"Start of Maneuver Day of Year" (byte offset 955-956).*
    - *"Start of Maneuver UTC Time of Day" (byte offset 957-960).*
    - *"End of Maneuver Year" (byte offset 961-962).*
    - *"End of Maneuver Day of Year" (byte offset 963-964).*
    - *"End of Maneuver UTC Time of Day" (byte offset 965-968).*
    - *"Change in Spacecraft Velocity" (byte offset 969-980).*
    - *"Spacecraft Mass" (byte offset 981-988).*

4 Data Record Modifications

- *Reworded the descriptions of bits 20-24 of the "Quality Indicator Bit Field" (bytes 25-28) to make them consistent with the new terminology for the PACS quality flags.*
- Added definition for bit 0, which was previously undefined (zero fill), of "Scan Line Quality Flags [Calibration Problem Code]" (byte offset 31): "scan line was not calibrated because of satellite maneuver (Metop) or <zero fill> (NOAA)".
- *Defined bit 2, which was previously undefined (zero fill), of "Scan Line Quality Flags [Calibration Problem Code]" (byte 31): "no visible calibration due to either the presence of MIRP pseudonoise in place of AVHRR data (NOAA only) or calibration processing being turned off."*
- Added definitions for bits 0 and 1 of "Scan Line Quality Flags [Earth Location Problem Code]" (byte offset 32):
    - bit 1: "not earth located because of satellite in-plane maneuver (Metop) or <zero fill> (NOAA)"
    - bit 0: "not earth located because of satellite out-of-plane maneuver (Metop) or <zero fill> (NOAA)"
- Changed the scale factor of the following fields from 6 to 7:
    - IR Operational Cal Ch 4 Coefficient 3 (byte offset 261-264)
    - IR Test Cal Ch 4 Coefficient 3 (byte offset 273-276)
    - IR Operational Cal Ch 5 Coefficient 3 (byte offset 285-288)
    - IR Test Cal Ch 5 Coefficient 3 (byte offset 297-300)
- *Added the following two new navigation-related field. They are located in what were spare bytes. The preceding spare (zero fill) field was eliminated to accommodate these new fields.*
    - *"Computed Yaw Steering" (bytes 301-306)*
    - *"Total Applied Attitude Correction" (bytes 307-312)*
- *Defined the following bits, which were previously undefined (zero fill), of "Navigation Status Bit Field" (bytes 313-316):*

- *bits 20-19: "yaw steering parameters usage indicator"*
- *bit 18: "Metop maneuver indicator"*
- *bit 17: "earth location at the satellite subpoint is accurate and reasonable"*

- *The individual bit flags that make up the "Analog Telemetry Update Flags" (byte offset 4017-4020) were re-ordered to match how they are actually being output.*